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age; racemes 7–8 cm. long; flowers 1 cm. long, geminate or in clusters, scattered; bracts subulate or setaceous, persisting; calyx-teeth acuminate, as long as the tube; corolla purplish, vexillum pubescent; legume 3–4 cm. long, 4 mm. wide, spreading, cinereous-pubescent or glabrate, straight; seeds 6–9, ovoid, somewhat truncate at the ends, brown.

Ballast ground, Mobile, Alabama (Ch. Mohr); Mexico and the West Indies, etc.

Original locality: Jamaica.

I am much indebted to Dr. N. L. Britton for his help and counsel in this study and for the use of the Herbarium of Columbia College. Mr. G. V. Nash has given me valuable assistance with copious field notes of the Florida species.

Mr. Coville also very kindly loaned me the collection of the United States Department of Agriculture for examination.

Contributions to American Bryology.—IX.

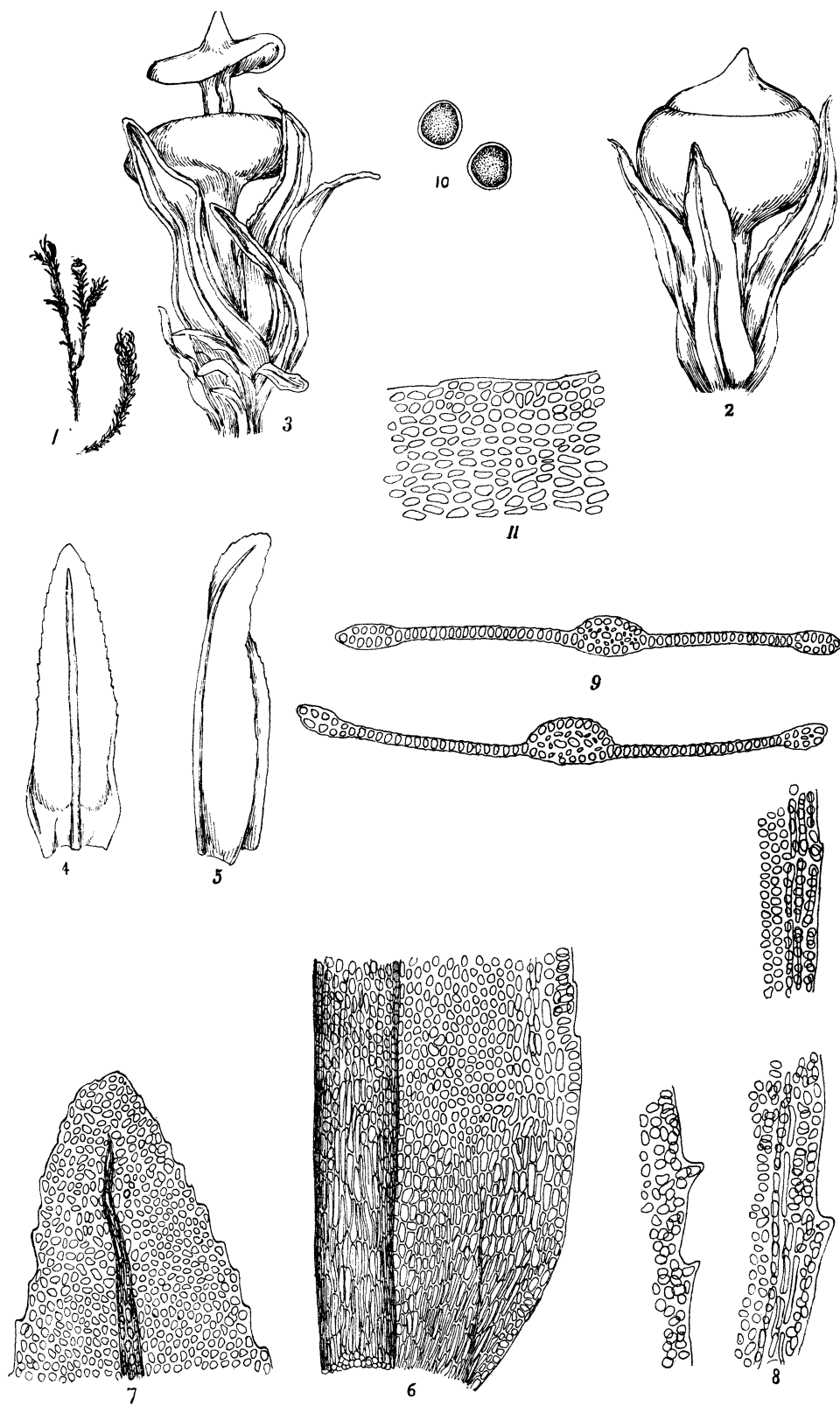
BY ELIZABETH G. BRITTON.

A REVISION OF THE GENUS *SCOULERIA* WITH DESCRIPTION OF ONE NEW SPECIES.

(PLATE 227.)

The genus *Scouleria* was founded by Wm. Hooker in 1830, on specimens collected by Dr. Scouler at Observatory Inlet, described as *S. aquatica*, and subsequently distributed in Drummond's *Musci Americani* as No. 63, collected in the Columbia and Portage Rivers. A few autograph duplicates of Dr. Scouler's specimens were also distributed in this country, and Dr. Torrey was fortunate in possessing one of them, as well as a set of Drummond's Mosses.

In 1851 C. Mueller transferred *Scouleria aquatica* to *Grimmia* as *G. Scouleri*, and Lesquereux and James in the Manual 1884 followed his example. Mitten in 1869 also subordinated the genus to *Grimmia*, describing one new species *Grimmia patagonica* (Journ. Linn. Soc. 12: 96, 1869), which Jaeger (Adumb. 1875) changed to *Scouleria patagonica*. Since then the genus has been



SCOULERIA MARGINATA E. G. BRITTON

maintained as valid. In 1889 Kindberg described in the BULLETIN *S. aquatica* var. *nigrescens*, which Mueller in 1890 raised to specific rank as *S. Nevii*. In Macoun's Catalogue, 1892, another species was described by Kindberg *S. Muelleri*, and in a recent number of Hedwigia Mueller described *S. aquatica* var. *catilliformis* from Röhl's collections. This makes four species and one variety thus far described in the genus.

Having had occasion to examine critically some specimens received from the Department of Agriculture, collected in the State of Washington by Leiberg and Sandberg, I found it necessary to see authentic specimens and original descriptions of all the species. These we have been fortunate in possessing either in the Torrey or Jaeger herbaria, where we found Lobb's specimens of *S. patagonica*, and the others have been sent us by Prof. Macoun, and by Dr. Watson in former years.

As a result we have reached different conclusions from those of Müller and Kindberg, and are of the opinion that *S. aquatica* is a very variable species, within certain narrow limits. That the forms which have been separated from it as *S. Nevii*, and *S. Muelleri*, intergrade with it is beyond question, and I have been able to prove that the characters which have been relied on to found specific differences may all be found on one specimen, of either or any of the species distributed under the new names. There are some characters which seem to have been given too much weight, and others too little. I find that the tendency to differentiation of the cells bordering the leaves runs through all the species, and reaches its maximum in the Patagonian specimens, by the formation of a thick border just inside the margin, composed of parenchyma cells on the upper surface of the leaf, with yellow prosenchymatous cells on the lower surface like those composing the vein, giving the leaf the aspect of being triple-veined. In Watson's specimens from Spokane Falls, which I have described as a new species, *S. marginata* (presumably those referred to in the Manual under *G. Scouleri*) I also find this character developed though in a less marked degree. The margins are bistromatic, or else the cells are larger and darker in color, though never as dense and dark, as in *S. patagonica*. Specimens of *S. aquatica* var. *nigrescens*, also show an upward continuation of the basal

submarginal prosenchymatous cells, and this is more or less evident in all the specimens, even Scouler's of *S. aquatica*, though much less prominent in the young green leaves from the apex of the stems than in the older leaves, where they become differentiated in color, showing as yellow streaks, irregularly between the vein and margin, but always near the margin.

Another peculiar character, which has been mentioned in *S. patagonica*, but not in any other species, is the development of filamentous radicles on the vein at base. Mitten described them "Nervo obscuro inferne dorso radicellis vestito." This character is very prominent in some of our specimens, and in fact is hardly absent from any of them, the whole lower surface of the vein in some leaves being densely covered with scattered or tufted, seemingly glandular hairs. The serrations of the margins too, are very variable, and of no value for distinguishing the species. The young green leaves are always more sharply and irregularly serrate, generally also at the apex, but the older leaves on the same stems, are often entire at apex, and indistinctly serrate below; I have even seen leaves quite entire, on the same plants. The teeth are often black and swollen, though this is never a constant character.

The cucullate apex, for which Mueller has named the var. *catiliformis*, is due to the bending of the vein a short distance below its apex. This too seems to be a character of the younger leaves. They also vary in being serrate on the back near the apex, and the vein is sometimes much thickened, and prolonged to the summit of the leaf, as figured by Schwaegrichen, instead of ending below the apex as it usually does. The color and size of the 3-4 rows of marginal cells of the leaves also varies, and in some leaves the green quadrate cells of the margins are so sharply differentiated from the elongated narrower submarginal ones, that they form an undulate border next to a deep yellow fold on each side.

SCOULERIA AQUATICA Hook. Bot. Misc. 1: 33, t. 18 (1830).

A portion of the type specimens collected by Scouler are in our possession, and the following description was drawn from them, giving measurements which Hooker did not give.

Plants 5-6 cm. long, stems flexuose, sparingly branched; lower leaves abraded, upper oblong lanceolate, 4 mm. long by 1.5 mm.

wide, apex cucullate, rounded, entire or serrate, vein ending below it, not filamentous at base; margins serrate only above the middle, not bordered, the cells only slightly larger and darker, upper cells irregular, .010–.013 mm.; basal rectangular, rarely a few prosenchymatous cells were seen just inside the basal margin, mostly pale and rectangular. Spores .048–.050 mm., smooth, brown.

On consulting the original description and plate, we find that *Scouleria aquatica* was originally described as black, and the type specimens are quite as dark as Macoun's specimens of var. *nigrescens*, thus invalidating the first and most conspicuous character of that variety. The leaves are described as dark green, the upper ones only as green. The border of the margin is indicated by submarginal lines in figures 2–3 of the original plate.

The specimens distributed in our set and Prof. Macoun's of Drummond's Mosses No. 63 differ from Scouler's and from each other slightly. Prof. Macoun has three plants, two are 12–13 cm. long, large, coarse, simple stems, and sterile, with the leaves long and broad, coarsely serrate and bordered with yellow, the vein strongly filamentous, the submarginal basal cells yellow and prosenchymatous, and the lower margins undulate. The third plant in his set is a small branching, fertile one, with black abraded leaves, shorter and denser, often entire, with the margins yellow and thickened. Our specimens of Drummond's No. 63 are like these, the leaves being only 2–2.5 mm. long, and differing from Scouler's in their blunt, flat, entire apex with the basal cells more distinctly prosenchymatous and yellow. They were cited in the original description of *S. aquatica*.

It seems evident from the above that, as originally founded, this species was recognized as variable, for we have indicated three discrepancies in the original specimens and descriptions. The larger forms may be referred to the variety *nigrescens* Kindb., which may be distinguished by the taller plants, darker and coarser than the type, with long simple stems, large black leaves, often blunt and entire at apex, the basal cells yellow or brown, prosenchymatous, with the vein often thickened and serrate at apex and filamentous at base.

SCOULERIA NEVII Müller, Bull. Torr. Bot. Club, 17: 273 (1890).

The description given in Macoun's catalogue for *S. Nevii* is more than half devoted to *S. aquatica*, and from it we gather that

the main difference is the width and shape of the leaves, and the broad, rounded entire apex. We have seen all of Prof. Macoun's specimens, and tried the following experiment; taking several stems from different plants, we divided them into 5-6 sections each, and compared the leaves. In all cases we found that the upper green leaves at the tips of the branches were longer and narrower, more acuminate and more sharply serrate, with the apex also serrate and generally cucullate; the lower cells also were seldom differentiated, generally paler and oblong, not prosenchymatous. The lower leaves on the same plants were shorter and broader, often entire and rounded at apex, the cells denser and darker, and often yellow with traces of prosenchymatous cells.

We have not been able to find that any of the characters are constantly associated together, so that we cannot maintain *S. Nevii* as a species, even if the name had priority over the var. *nigrescens*; but there seems to be sufficient reason in maintaining the latter as a variety, as we have shown from the descriptions of Drummond's specimens and Macoun's collections.

We found one of Macoun's specimens of "*S. Nevii*" agreed with the specimens from Yale labelled var. *virescens* (Bull. Torr. Bot. Club 16: 93, 1889), having the upper leaves of that brilliant emerald green color which is so striking in these specimens. On the younger and smaller plants the leaves are green. Large, coarse, old plants, with ragged leaves, are almost black.

SCOULERIA MUELLERI Kindb.; Macoun's Catalogue, 6: 62 (1892).

Macoun's Canadian mosses, No. 558.

The description calls for different specimens from those of No. 558, which we have received from Prof. Macoun. Those sent us are undoubtedly referable to *S. aquatica*, with which they agree in every way. The description reads the median basal cells "linear, porose and numerous," the apex entire rounded, and the margin "pale orange." In our specimens the basal cells are rectangular, with a few very faint traces on some of the leaves of the yellow prosenchymatous cells referred to in the description. The apex is as often serrate as entire, and the marginal cells are green, in 6-7 rows, and though larger and more distinct than the inner ones, are not "pale orange."

We have taken particular pains to see as many specimens of Macoun's No. 588 of *S. Muelleri*, as possible, thinking that perhaps there might be a mixture of specimens, and perhaps our *S. marginata* be found among the number. But Prof. Macoun assures us that the species is local, and all the specimens of this number were collected from the same place and grew on the same rock. This is very interesting, for the specimen in our set agrees with Scouler's specimens of *S. aquatica*, the ones from Prof. Eaton's set are referable to var. *nigrescens*, and these last of Macoun's, he assures me, are the very ones from which Kindberg named *S. Muelleri*.

Key.

Leaves bordered by slightly larger, thick-walled cells, in a single layer, green, yellow or black, peristome present,1. *aquatica*.
Leaves bordered by larger, denser cells in a double layer, often prosenchymatous almost to apex, peristome absent,2. *marginata*.

I. SCOULERIA AQUATICA Hook.

Scouleria aquatica Hook. Bot. Misc. 1: 33, t. 18 (1830).

Grimmia Scouleri Müll. Syn. Musc. Frond. 2: 654 (1851).

Scouleria aquatica var. *virescens* Kindb. Bull. Torr. Club, 16: 93 (1889).

Scouleria Muelleri Kindb. Macoun's Cat. part 6: 62 (1892).

Scouleria aquatica var. *catilliformis* Müll. Hedwigia, 32: 207 (1893).

Plants dark green or black, gregarious, growing in tufts; stems rigid, simple or branching, 5–15 cm. long; leaves when old abraded, only the veins remaining, upper green, walls less thickened, more prominently serrate than the lower, which are often black, entire, bordered with yellow or black thick-walled cells; vein thick, ending below the apex, often arched and serrate on back above and filamentous below; apex rounded and flat or cucullate, serrate or entire; basal cells variable on the same plants, on the upper leaves pale often entirely rectangular, on the lower often yellow or brown, with streaks of prosenchymatous cells; just inside the margin, extending upward irregularly, the marginal rectangular, often undulate. Capsules almost immersed, on a short seta, oblate-spheroidal, becoming more depressed after the dehiscence of the lid, which remains attached to the columella, and exserted, long after maturity; calyptra cucullate, peristome single, red, teeth 16, irregularly divided and broken, often falling

with the lid; spores large, smooth, .037-.059 mm. maturing in May and June to August and September.

A variable species, growing on rocks in mountain streams, more or less local, but abundant.

Original locality: Observatory Inlet, Scouler, 1829. Distributed from the Columbia and Portage Rivers in Drummond's North American Mosses, No. 63. Also collected by Lyall in the Columbia River, by E. Hall in Oregon, Bolander in California, Leiberg in Traill River and Lake Pend d'Oreille, Idaho, and by Macoun in several localities in British Columbia and Vancouver Island.

- 1a. *SCOULERIA AQUATICA NIGRESCENS* Kindb. Bull. Torr. Club, 16: 94 (1889).

Scouleria Nevii Müller, Bull. Torr. Bot. Club, 17: 273 (1890).

Plants coarse and rigid, in large dense black tufts; stems 10-15 cm. long, brittle, and clothed with the persistent veins of the leaves, branching above; leaves 2-3 mm., oblong lanceolate, blunt and entire at the rounded apex, vein ending below it, often radiculose at base; margins serrate, basal cells rectangular next the vein, prosenchymatous near the margin, but extending upward only a short distance; some leaves simply hyaline at base with all cells rectangular.

Original locality "On rocks in Nanaimo River, Vancouver Island. Also collected at Sicamous, B. C., in 1889, and Rogers Pass, Selkirk mountains, B. C., in 1890 and 1885. Distributed as No. 388 of Macoun's Canadian mosses.

These four specimens, presumably named by Kindberg, illustrate the variation of the species, two being large, coarse plants, with larger leaves and the basal cells prosenchymatous, the other two small branching plants, with short leaves, and the basal cells scarcely prosenchymatous.

2. *SCOULERIA MARGINATA* n. sp. Plate 227.

Plants 3-4 cm. high, gregarious in dense black tufts; stems wiry and naked at base, branching and densely leafy above; leaves crowded, curled and twisted when dry, only the uppermost green, 2-3 mm. long, oblong lingulate, serrate above the middle, or obscurely serrulate near the base, teeth occasionally black and thickened; apex blunt, entire or toothed, vein thick, ending below it, smooth on back; basal cells green rectangular, a narrow band, near the margin elongated, prosenchymatous, forming a dark dense border nearly to the apex of the leaf, superposed by rounded small

cells; perichaetial leaves surrounding the capsules, ovate-lanceolate; capsules, small, broader than long, cupuliform when old; lid persistent on the columella, bordered with red; peristome none, mouth bordered; spores .048-.054 mm., green with a minutely roughened coat, maturing in August and September.

"Spokane Falls, Washington Territory, collected by Sereno Watson, September 24, 1870." Presumably the same specimens are referred to in the manual under *G. Scouleri*, Müller, as being abundant. Distributed with the plants collected on Clarence King's Expedition on the Exploration of the 40th Parallel.

Since collected by Marshall A. Howe on rocks just above the water in the Sacramento River, Sims, Shasta county, Cal., August 10, 1894.

Closely allied to *S. Patagonica*, but the marginal cells are less dense, often only one layer of cells, but larger and square in section.

Description of Plate 227.

Fig. 1. Plants natural size. 2. Capsule enlarged, lid on. 3. Capsule after dehiscence of lid. 4-5. Outlines of leaves. 6. Basal cells of leaf. 7. Apex of leaf. 8. Cells from the middle of the leaf, showing the elongated, submarginal cells. 9. Cross-sections of leaf, showing the thickened margins. 10. Cells from the upper surface of the leaf. 11. Spores.

Studies in the Botany of the Southeastern United States.—III.

BY JOHN K. SMALL.

(PLATE 228.)

TSUGA CAROLINIANA Engelm. Coult. Bot. Gaz. 6: 223 (1881).

This tree can now be added to the flora of Georgia. Formerly it was known only from the Carolinas and Virginia. There it grew at altitudes ranging from 2,100-5,000 feet. I found it in 1893 growing on the southern ledges of the cañon at Tallulah Falls, thus extending its range many miles to the south and its altitude to 1,600 feet. It was most plentiful about 300-400 feet above the river and reached no great development on account of the scarcity of soil and the perpendicular position of its place of growth. As was the case in all the other localities where I saw